A mapping analysis of maintenance in Industry 4.0

M. Di Nardo[a]* • M. Madonna[b] • P. Addonizio[b] • Maryam Gallab[c]

[a]Department of Materials Engineering and Operations Management, University of Naples "Federico II", Italy
[b]Operational Territorial Unit of Naples – Certification, Verification and Research Area, INAIL, Italy
[c]MIS-LISTD Laboratory, Computer Science Department, Mines-Rabat School (ENSMR), Avenue Hadj Ahmed Cherkaoui, Agdal, Rabat, Morocco

Abstract: This paper analyses and reviews the most crucial literature papers relating to the evolution of maintenance in Industry 4.0 and its applications. The topic's importance is stated by an increasing number of publications in this field, which suggested a systematic literature review.

The proliferation of hardware devices in the workplace, such as smartphones and tablets, has caused engineers to develop the industrial sector's maintenance world. This review aims to classify the literature published from 2015 to early 2020 to identify the significant benefits and areas it obtained.

This study surveys the latest approaches and emerging trends in maintenance management strategies commonly used in the era of Industry 4.0. It discusses the state-of-the-art of Industry 4.0 technologies and the associated use of manufacturing and maintenance management. The data collection was obtained by conducting a systematic search of the literature.

The goal of this study to analyze and understand how maintenance is evolved to meet its requirements to identify " Maintenance 4.0" regarding crucial aspects and future trends.

*Corresponding author.
E-mail address: mario.dinardo@unina.it(M. Di Nardo).
Peer Review under the responsibility of Universidad Nacional Autónoma de México.

1. Introduction

The globalization process that is taking place worldwide requires companies to put in place new strategies to adapt their competitiveness to international standards to affirm their persistence in the global market. In this new scenario, the business competitiveness strengthens not only through the "classic leverage" of cost reduction but also by pursuing an organizational approach that promotes innovation and maintains competitiveness in the future. In this context, appropriate maintenance management of physical assets assumes increasingly significant importance for business results. Efficient maintenance management, by preventing breakdowns, positively impacts the factors that affect competitiveness in terms of safety and environmental issues. However, not all companies, even those defined as "intensive assets", are conscious of this opportunity. The reason lies in an organizational culture that remains anchored to a traditional maintenance approach, essentially a repair, without making it evolve towards a more complex activity. Through prevention actions along the whole life cycle of the equipment and the pursuit of continuous improvement, the maintenance can give value to the company business in a broader systemic perspective. According to the new demands that arise mainly from the evolution of the social context, where an increasingly important is attributed to safety, quality of life and respect for the environment, the maintenance system has revised necessary its strategies. Hence, over the years, the maintenance paradigm is changing, and now industrial maintenance has become a strategic factor in ensuring industrial systems' productivity (Gallab et al., 2017; Sharma et al., 2011). Maintenance has evolved to meet the needs of the current business trends. In today's technological era, maintenance is of utmost importance, and businesses are approaching its evolution in digital transformation.

Considering the dynamics of maintenance management and the range of opportunities arising from Industry 4.0, the study finds the current relationship between maintenance and Industry 4.0 and contrasts many stands. The goal is to analyse state-of-the-art maintenance in an industrial context and understand how maintenance is evolved to meet its requirements to identify "Maintenance 4.0" regarding crucial aspects and future trends. While the Industry 4.0 keyword dates back to 2011 (Kagermann et al., 2013), the first papers dealing with maintenance in smart factories were published in 2015, and the last report on maintenance in smart factories was published in 2020.

Indeed, the nine pillars of Industry 4.0 (Vaidya et al., 2018) are very beneficial in maintenance, significantly augmented reality (Bousdekis et al., 2021). Augmented reality applications have shown great relevance in terms of quality control and supervision, assembly, maintenance, and safety activities. For this reason, it has become very applied in manufacturing companies (Bottani & Vignali, 2018).

Augmented Reality (AR) provides a seamless interface that mixes the real and virtual world to improve collaboration between humans and intelligent environments (Mourtzis, Vlachou et al., 2017) and has become an innovative and effective solution for solving many critical issues to assist and improve maintenance processes before implementation (Nee et al., 2012).

The paper is structured as follows: Section 2 explains the research methodology. Section 3 is devoted to the review results, followed by Section 4, which presents authorship and collaboration. And finally, a conclusion is provided in Section 5.

2. Research methodology

2.1. Databases, keywords, inclusion criteria

The research methodology we used is a systematic literature review as it is a routine test of the current state of knowledge regarding a given topic. A systematic literature review structure is systematic in collecting and synthesising literature, and it is straightforward and reproducible in presenting findings (Rhoades, 2011).

This study focuses on literature review thanks to the search using the Scopus database (http://www.scopus.com/).

The first step of a systematic literature review is defining the strategy of locating, selecting and including the studies. In this paper, a computerised search was made using the Scopus database (http://www.scopus.com/) to identify relevant studies.

The research was performed by making queries on Scopus with the general keywords or topics most frequently used in the peer-reviewed literature: "Maintenance", "Industry 4.0", "Augmented Reality", "Maintenance 4.0".

The research uses the following strings:

• Query 1: "Maintenance" and "Industry 4.0" in tiles-abstracts-keywords and "Augmented Reality" in all the databases.
• This search query identifies 112 documents.
• The publication timespan was limited to be between 2015 and 2020.
• The studies were also limited to the English language.
• Only scientific articles and reviews are considered (f.e. conference papers were excluded).
• Due to the application of these limitations, the result consists of 38 documents.
• Query 2: "Maintenance" and "Augmented Reality" in tiles-abstracts-keywords.
• This search query identifies 948 documents.
• Timespan was limited to be between 2015 and 2020.
• The studies were limited to the English language.
• Only scientific articles and reviews are taken into account.

• Due to the application of these limitations, the result consists of 151 documents.
• Query 3: "Maintenance 4.0" in tiles-abstracts-keywords.
• This search query identifies 30 documents.
• Due to the application of that limitation, the result consists of 25 documents.

The hunt from which a total of 218 papers were selected was narrowed down to 198 papers without duplicates. During which we omitted articles that turn out to be preliminary conference papers or articles that were erroneously listed as journal papers in the science databases. Other papers from the inquiry were omitted for not having any author name. The entire collection of 197 papers is documented in Table 1.

2.2. Classification

The emphasis of this paper is the substance of 197 science study papers examined:

1. Applications papers (92): papers whose main aim is to develop and test new ideas and applications in the real world or laboratory.

2. Review papers (33): papers whose main aim is to conduct a literature review, study state of the art, and make a methodological analysis.

3. Conceptual papers (72): papers whose main aim is not to develop new solutions but to analyse some specific aspect or problems of Maintenance 4.0 and A.R. solution in this field.

The whole sample of papers reviewed and analysed have been reported in Table 1 (in Appendix). Each paper has been matched to the type of article to which it refers.

3. Review results

First of all, paragraph 3.1 is reported geographical statistics and the publication trend in time for the whole sample of papers. Then in paragraph 3.2 and subsections 3.2.1, 3.2.2, 3.2.3, the three groups of papers are analysed separately, highlighting the main points of interest of the most relevant and cited papers through citation analysis. The analysed studies suggested highlighting two parameters related to the keywords found in the articles, called "Frequency" and "Persistence". The first one shows the number of articles in which a specific keyword appears. The "second one" is used to highlight the number of years since an argument is introduced as a keyword, and so it shows the keyword's importance in time. The keywords study is conducted, exporting them automatically from Scopus research to Excel with the "Export" function.

3.1. Trend of publication in time

The three categories of papers are in this paragraph shown based on publication year (fig.1). This analysis aims to put in evidence more attention during the year to "Maintenance 4.0" and "Augmented Reality" themes. The publication period is the same as the preliminary research and goes from 2015 to 2020. As we can see in this figure, there are only 16 publications related to the topic in the first year of study (2015), while in the last one (2020), the number of papers reaches a peak of 61. The most significant increase of publication occurred between 2018 and 2019 (22), and it shows that after an almost constant trend in the first three years, between 2019 and 2020, the "Maintenance 4.0" topic aroused a consistent interest with 108 total publications.

Fig. 2 divides the total number of publications per year in "application", "conceptual", and "review" groups. First, it shows that "review" papers are the least published during the all-time span, with a total of 29 articles. Simple discoveries on a particular topic may only be made after several scientific articles by various scientists have been written.

The total number of publications of "conceptual" and "application" papers is close: 72 vs 92; it is very interesting to put in evidence that only in the last year (2020) "conceptual" papers with 29 publications overcome "application" papers with 23 publications. The development of "conceptual" and "application" papers is motivated by the widespread diffusion in the recent years of "Industry 4.0" instruments in the maintenance sector (Fig 1, Fig 2).

A geographical distribution analysis of the studies is shown in Fig 2. It could be exciting to understand in which country the "Maintenance 4.0" argument is developing. The country of the papers was assigned, taking into account the nationality of the first author, which is a very common approach in review studies (e.g., (Gao et al., 2017). The figure shows that most of the studies comes from Italy (23 papers: 15,02%), UK (18 papers: 9,32%), China (17 papers: 8,8%), USA (1 papers: 8,8%), Spain (13 papers: 6,73%) and Germany (10 papers: 5,18%). This result is due to industries adopting this new kind of maintenance in these countries for the first time. A consideration that could be done for the leading country, Italy, is that there are no differences between the number of "conceptual" and "review papers" (7), while "application" papers reach a peak of 15 papers. Finally, many countries have carried out very few (i.e., one or two) studies, demonstrating that this technology is still in its early adoption stage.

3.2. Paper categories

This paragraph is extrapolating the main point of interest of the whole sample of papers, divided into three groups. In Tab. 2.1, 2.2, 2.3, the relevance of the papers is shown through a citation analysis that sorts review, conceptual and application papers in order of total citations and citations per year. Citations per year also highlight new papers that have less chance of being cited (Table 2.1, Table 2.2., Table 2.3).
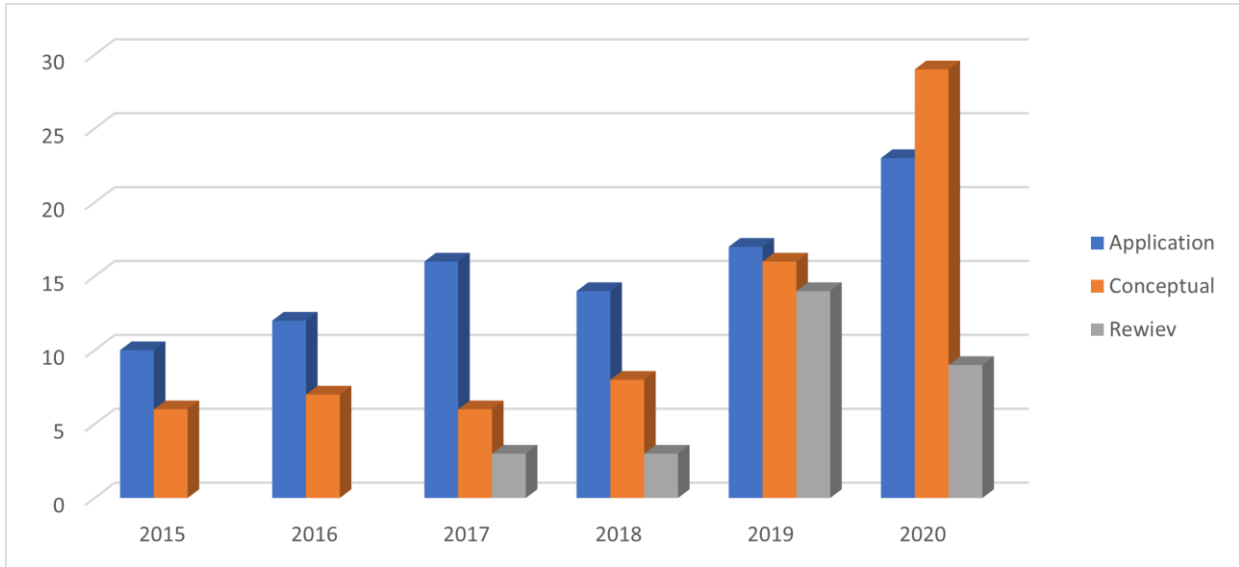
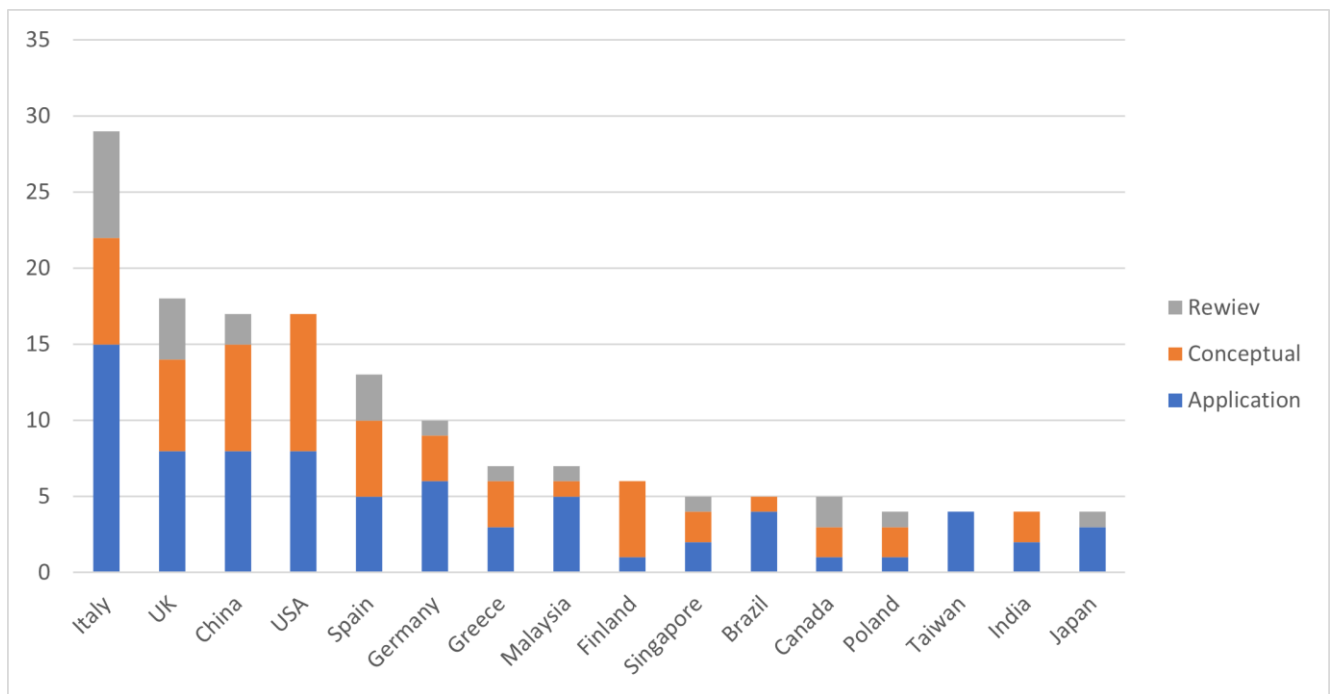Figure 1. Trend of publication in time for three groups of paper.

Figure 2. Geographic distribution of the studies reviewed.

Table 2.1. Citation analysis for "review" papers.

Paper	Citations	Citations/Year
(Palmarini et al., 2018)	163	55,4
(Younes et al., 2017)	52	13
(Bottani & Vignali, 2018)	42	21
(Gattullo, et al., 2019)	40	20
(Cimino et al., 2019)	27	13,5
(Fernández del Amo et al., 2020)	18	6
(JasiulewicZ-Kaczmarek & Gola, 2019)	15	7,5
(Bousdekis et al., 2021)	1	1
(Bottani & Vignali, 2018)	76	25,3

Table 2.2. Citation analysis for "conceptual" papers.

Paper	Citations	Citations/Year
(Gavish et al., 2015)	206	34,3
(Roy et al., 2016)	123	24,6
(Aromaa & Väänänen, 2016)	68	13,6
(Uva et al., 2017)	53	17,6
(Fantini et al., 2020)	51	51
(Elia et al., 2016)	48	9,6
(Jetter et al.,2018)	35	11,6
(Poushneh, 2018)	31	10,3
(Vaidya et al., 2018)	274	91,3
(Gallab et al., 2017)	12	3

3.2.1. Review papers

The 29 review articles' overarching aim is to summarize the recent literature surrounding Maintenance 4.0 and the AR-enabled consequences of Industry 4.0.

Previous works of Damiani et al. (2018) which are not present in the sample of papers, want to highlight the importance of AR technology in the whole Industrial 4.0 system, while Mourtzis, Vlachou et al. (2017) indicate that own maintenance together with Virtual Training is the main application areas.

Table 2.3. Citation analysis for "application" papers.

Paper	Citations	Citations/Year
(Chen et al., 2016)	57	11,4
(Mourtzis, Zogopoulos, & Vlachou,2017)	56	14
(Plopski et al., 2015)	53	8,83
(Masoni et al., 2017)	52	13
(Chicchi Giglioli et al., 2015)	43	7,16
(Lima et al., 2017)	40	10
(Neges et al., 2017)	40	10
(Fernández-Caramés et al., 2018)	38	12,6
(Mourtzis, Vlachou et al., 2017)	68	17
(Nee et al., 2012)	348	38,6

Instead, Palmarini et al. (2018) propose a "systematic review of augmented reality applications in maintenance", showing that AR's current field in maintenance is Mechanical maintenance, Plant maintenance, Consumer Technology, and the Aviation Industry. Techniques and technology related to A.R. in the maintenance field are also studied by Fernández del Amo et al. (2018) through an important literature review for knowledge transfer in maintenance application.

Very interesting and new application papers in this area are the studies conducted by Tanaka et al. (2019) that studied 3D CAD Models for VR/AR viewing during the bridge maintenance process and the practical augmented reality-assisted maintenance system for adaptive user support proposed by Siew et al. (2019).

An important research methodology towards Augmented Reality manuals for industry 4.0 is provided by Gattullo et al. (2019). Bottani and Vignali (2018) propose a review of the last decade of "Augmented reality technology in the manufacturing industry", indicating among the other things that new technologies as a 3D scanner, holographic display, and connected mobile devices are moreover utilised in the manufacturing industry and so in the maintenance field.

An overview of maintenance evolution through Industry 4.0 technologies, also called Maintenance 4.0, is analysed by new review papers like Silvestri et al. (2020), and JasiulewicZ-Kaczmarek and Gola (2019), which is highlighted the progressive evolution and the actual way to do maintenance during the fourth industrial revolution.

3.2.2. Conceptual papers

As a result of the research, 72 articles are conceptual that want to describe general aspects, problems, and solutions of Maintenance 4.0. and of AR technologies in the industrial manufacturing field. Conceptual papers are in the Tab. 3.2 classified in order of total citation and of citation per year to highlight its scientific relevance. Uva et al. (2017) published a critical practical paper, which draws a literature review, tests and business experience feedback to A.R. technologies used in the potential smart factories. This paper presents an evaluation of the efficiency of conveying technical instructions with this SAR prototype and shows the improvement of operators' efficiency.

Fantini et al. (2020) and Jetter et al. (2018) propose manuscripts on the increasing transition of manufacturing companies to the Industry 4.0 concept and the various AR technologies developed in the maintenance sector. These papers could be very interesting in how these topics are becoming fundamental targets, making the industrial manufacturing sector competitive during the year.

"Maintenance 4.0: Intelligent and Predictive Maintenance System Architecture" suggested by Cachada et al. (2018) illustrate the growing value of maintenance as a part of the manufacturing methods. The paper looks at why maintenance is abandoning its traditional strategy and is now focusing on utilising a predictive and constructive approach (Condition-based Maintenance). The application of such techniques includes a well- structured infrastructure that can be enhanced by using the Internet of Things (IoT), artificial intelligence, and cloud computing.

In this paper Chahada et al outline the design of an insightful and predictive maintenance framework consistent with the ideals of Industry 4.0. It is an advanced and online review of the collected data for the earlier prediction of system defects and assists technicians through repair interventions by offering directed intelligent decision support. Ceruti et al. (2019) look at how Business 4.0 principles will enhance the condition of maintenance. The conference will concentrate on developing AR and Additive Manufacturing (AM) technology, which will help sustain and develop goods. The proposed AR/AM systems are proposed as feasible tools in aviation maintenance. The sources Jasiulewicz-Kaczmarek et al. (2020) or allow fascinating proposals that should be further researched. Both papers address the various methods of current maintenance. The first viewpoint in this paper is the historical perspective, and evolution has been described in the approach to maintenance in light of manufacturing engineering growth. The following viewpoint explores the topic of data- driven maintenance and the historical development of maintenance data. The third viewpoint explores the need for maintenance in the sense of sustainable growth and prospective prospects to use data-driven maintenance technologies to apply the fiscal, environmental and social challenges of sustainable production.

3.2.3. Applications papers

Maintenance 4.0 uses advanced technologies for predictive analysis and provides decisions based on feasibility. Research has shown that the topic is currently used in a wide range of applications, and it will undoubtedly be a source of further applications in the future. It is often linked to augmented reality (AR). Masoni et al. (2017) affirm that augmented reality allows operators to view information necessary for direct execution in the work area without the need to refer to paper-based manuals. Moreover, AR could be helpful in the training field, allowing technicians, even the most inexperienced, to improve without an actual waste of material.

In general, Maintenance 4.0 behaves like preventive maintenance to avoid the occurrence of problems that could lead to damages or risks. For this reason, it obtains a vast number of consents in many fields of application. In order to demonstrate the effectiveness of this method, three practical examples are shown below in which this type of technology is used, namely that railway, naval and aeronautic fields.

The railway field must be taken into account that the railway is a highly complex system. In fact, from a technological point of view, it is made up of a set of physical elements that interact. Therefore, different internal or external factors could compromise the work.

In addition to that, the railway services must be able to respect time and spaces punctually and reliably. According to Kans et al. (2016), Maintenance 4.0 allows an advanced traffic management system thanks to a program that manages a large amount of data and information. It also gives a more accurate assessment of the vehicle's health, allowing it to extend the life of components. Indeed, this methodology's advantage in this context is an improvement in operations in all fields thanks to the further implementation of advanced systems (for example, the RFID technology that allows to analyse and view train data for maintenance planning economic).

Regarding the naval application fields, Kandemir & Celik (2020) state a Property Management System (PMS) that is used to plan times and hourly maintenance activities to prevent possible risks that can lead to failures. Thanks to the use of cloud-based sensors that allow monitoring and preventing failures related to phenomena such as vibrations or temperature near the critical parts of the ship.

Finally, regarding the aeronautical field, Industry 4.0 introduces several key technologies (such as networking, availability of big data and networks of micro-sensors connected) which, besides being suitable in factories, are also very useful in aeronautics. Ceruti et al. (2019) affirm that support local monitoring strategies in real- time, efficient big data management algorithms (Analytics) is necessary. This gives the possibility to collect data from millions of sensors (e.g., Bragg fibers included in composite structures) to find faster crack propagation.

3.3. Keywords analysis

The study of the authors' keywords for a selection of all items produced a total of 589 distinct terms. Not all papers use the appropriate author keywords' and were therefore omitted from the study. It is essential to remember that a wide range of keywords related to virtual reality, industry 4.0 and maintenance were also omitted from Scopus's search question. Obviously, these keywords have a more prominent presence, and they could theoretically be the study's findings. The data showed that writers prefer to use these keywords to convey the same idea through articles. According to Bottani and Vignali (2018), the keywords are gathered manually to evaluate related and dissimilar Keyword classes. In Table 3, only 20 keywords are listed to avoid bias, such as over-reporting trivial keywords. Frequency and longevity keywords will be displayed in colour (Figure 3).

Table 3. Keywords analysis.

Keyword	Frequency	Persistence	Min Year	Max Year
Virtual reality	15	6	2015	2020
Mixed reality	12	4	2017	2020
Internet of Things (IoT)	10	6	2015	2020
Building Information Modelling (BIM)	8	4	2017	2020
Predictive maintenance	7	3	2018	2020
Cyber-Physical Systems (CPS)	7	2	2019	2020
Industrial maintenance	7	5	2016	2020
Context Awareness	6	6	2015	2020
Manufacturing	6	3	2017	2019
Maintenance 4.0	6	3	2018	2020
Smart Factory	4	2	2019	2020
Cultural heritage	4	4	2017	2020
Digital twin	4	2	2019	2020
Authoring	4	5	2015	2019
Machine Learning	4	2	2019	2020
Product Service System (PSS)	3	3	2018	2020
Lifecycle	3	5	2016	2020
Sensors	3	6	2015	2020
Industrial internet of things (IIoT)	3	3	2018	2020
Training	3	4	2017	2020
Data analysis	3	3	2018	2020
Remote Maintenance	3	2	2017	2018
Maintenance operations	3	2	2019	2020
Ship maintenance	3	6	2015	2020
Edge Computing	3	2	2019	2020
Tracking	3	3	2017	2019
Collaboration	3	2	2019	2020
Computer vision	3	2	2019	2020
Human-machine interface	3	2	2019	2020
CAD	3	2	2019	2020

The upper-right quarter of diagram 3 reflects the category of old or repeated keywords used as a number. According to Bottani and Vignali (2018), study subjects that have been researched so much that they are deemed "well-established". The top-left quarter of search results concerning keywords emerged more than 2.5 years ago. This quarter contains subjects that are already being discussed yet that are still requiring further study. The bottom-left quarter is given recent keywords depending on their level of use. The contemporary subjects discussed in this essay could well vanish early, or they could become "trendy" in the years to come. The bottom-right quarter comprises just certain subjects that tend to be very promising important keywords used, as shown in Table. Sought out phrases such as "Predictive maintenance", "CPS", "Manufacturing", and "Maintenance 4.0" are frequently researched.

4. Authorship and collaboration

More than 700 scholars made over 200 contributions to the researched papers. Table 4 reports the number of authors per article and indicates that a paper can be published by a single (one) author or even more than 5 authors (Table 4).

Table 4. Number of Authors per paper.

Num. of Authors	Paper	Percentage
One Author	15	7,772020725
Two Authors	27	13,98963731
Three Authors	44	22,79792746
Four Authors	31	16,06217617
Five Authors	40	20,7253886
More than five	36	18,65284974
Total	193	

Three authors wrote forty-four papers, followed by 40 partnerships linked to five authors, followed by 36 papers written by more than five authors, followed by 31 collaborations written by four authors, followed by 27 papers written by two authors (13.98 percent). The increased number of researchers involved in the Maintenance 4.0 area and the fact that the research sector is multidisciplinary has inspired the collaborators.

It is found by the data gathered from the foreign partnerships, stated in Figure 4. Gephi was used to generate a graph consisting of nodes. In this article, the countries are represented by their country code, which highlights the number of writers from that country. Although European countries like Italy, the United Kingdom, Germany, and Spain lead with research articles, China and the United States are still contributing. Remind the reader that the interactions between the countries and the degree of cooperation indicate

the partnerships' importance. In addition to these most significant nation partnerships, nations like the U.K., Germany, and Spain are now collaborating together.

Gephi (https://gephi.org/) is a graphic representation tool, but it always returns a graph; it is therefore composed of nodes and arcs to which a personal interpretation must be attributed. It is useful for some descriptive statistics.The collaboration between authors from different countries shows the collectivity of science, both in terms of knowledge and in terms of resources.

With Gephi, a graph is represented, consisting of arcs and nodes. Consequently, in order to build it, it is necessary to import a table from Excel constructed as follows: Two columns are represented where the first column corresponds to the origin nodes and the second column to the target nodes. The arcs of the graph will be represented by the software itself, in this case representative of the collaboration between countries. Gephi will combine all the collaborations, represent through links the existing collaborations, and highlight the most frequent collaborations with ever thicker lines.
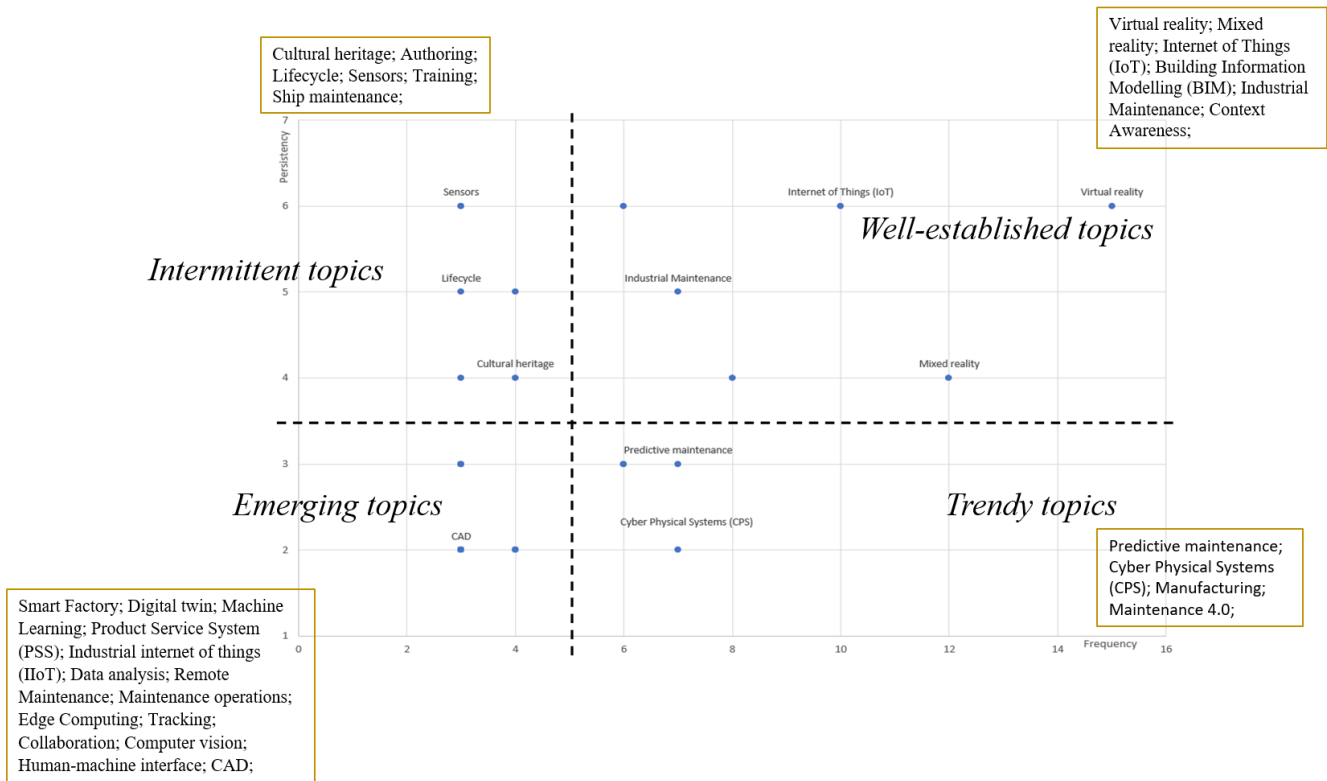

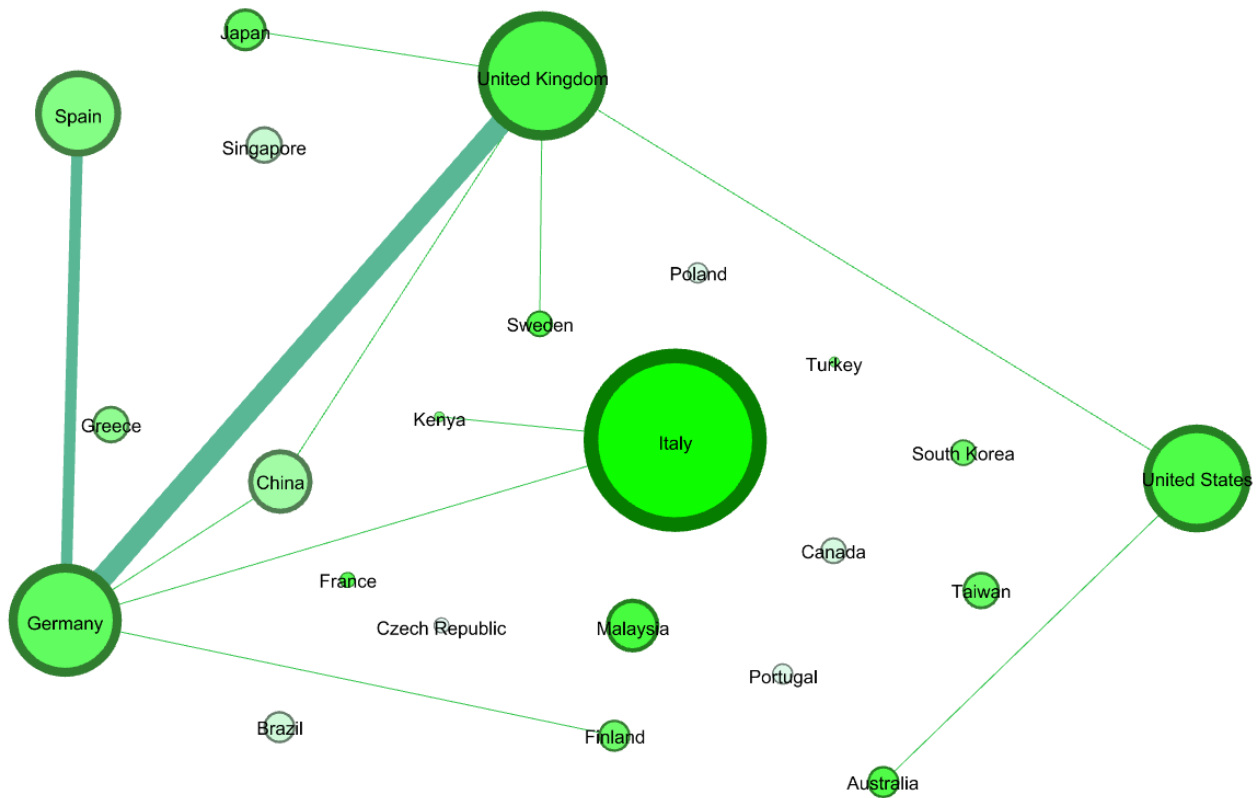Figure 3. Persistence versus frequency of keywords.

Figure 4. Collaboration ranks and strengths among different countries.

5. Conclusions

The research aim was to create an overview of the existing repair expertise and analyse the art's general state. Three separate search questions culminated in the discovery of 214 peer-reviewed articles conducted from 2015 to 2020. These studies centred on Industry 4.0 and maintenance/augmented reality. These articles have been categorized into the study paper (33), implementation paper (92), and development of a thesis (72). The entire collection of papers was analyzed concerning their year of publishing and where they were written. Subsequently, the reviews were independently reviewed, and philosophical and implementation papers were analyzed using a keyword scan to define the major topics discussed and their degree of dissemination in the science community. For each type of literature, a review was performed on the number of times the article has been referenced. Finally, after having dealt with three general forms, an additional study was carried out on the keywords, assessing the most relevant keywords' occurrence and durability, and another focused on the authorship. After that, it can be easily shown how the curiosity in the implementation of 4.0 and other innovations is growing gap In this subject, the capacity is severely limited as it has not yet been fully established. In reality, considering the diversified applications of this subject, it is difficult to define a specific sector that will profit from this topic the most. Furthermore, several experiments tend to have been conducted only in the laboratory, without applying this technology in a real setting, so further study is required to improve the applicability in less explored areas.

Appendix

Table. 1 Full list of papers retrieved and analysed.

Paper	Application	Conceptual	Review
(Abdul Rani et al., 2020)			X
(Aguero et al., 2020)		X	
(Akbarinasaji & Homayounvala, 2017)		X	
(Aleš et al., 2019)		X	
(Ali et al., 2020)		X	
(Alonso-Rosa, et al., 2020)			X
(Amirian et al., 2015)	X		
(Ansari et al., 2018)		X	
(Antonijević et al., 2018)	X		
(Antoniou et al., 2017)		X	
(Ariansyah et al., 2020)	X		
(Aromaa & Väänänen, 2016)		X	
(Arshad et al., 2016)	X		
(Aschenbrenner, et al., 2019)		X	
(Aschenbrenner, et al., 2016)		X	
(Aziz et al., 2018)	X		
(Aziz et al., 2020)		X	
(Baranovski et al., 2020)			X
(Ben Abdallah et al., 2019)	X		
(Bottani & Vignali, 2018)			X
(Bousdekis et al., 2019)			X
(Bruzzone et al., 2019)	X		
(Buchori et al., 2017)	X		
(Bousdekis et al., 2021)			X
(Butt, 2020)		X	
(Cachada, et al., 2019)	X		
(Cachada, et al., 2018)		X	
(Cahyati et al., 2019)	X		
(Câmara et al., 2019)		X	
(Ceruti et al., 2019)		X	

(Chaves-Diéguez, et al., 2015)	X		
(Chen et al., 2016)	X		
(Chen & Xue, 2020)		X	
(Chen et al., 2019)		X	
(Chen, Yang et al., 2020)	X		
(Chen, Lai, & Lin, 2020)	X		
(Chicchi Giglioli et al., 2015)	X		
(Cimino et al., 2019)			X
(Corradi et al., 2019)	X		
(Crivellaro et al., 2018)		X	
(Kaur et al., 2018)		X	
(Kawana et al., 2020)	X		
(Khalek et al., 2019)		X	
(Kharat et al., 2017)	X		
(Khowaja, Banire et al., 2020)			X
(Khowaja, Salim et al., 2020)			X
(Kim, 2019)		X	
(Kiziroglou et al., 2017)			X
(Koo et al., 2019)	X		
(Koteleva et al., 2020)		X	
(Lamberti et al., 2017)	X		
(Lawrence & Hendershot, 2020)		X	
(Lee, 2019)	X		
(Lee et al., 2018)	X		
(Lee & Park, 2019)		X	
(Leutert & Schilling, 2018)	X		
(Lima et al., 2019)	X		
(Limbu et al., 2018)		X	
(Liu & Seipel, 2018)	X		
(Longo et al., 2019)		X	
(López-Fernández et al., 2017)		X	
(Luchetti et al., 2017)	X		
(Mahmud et al., 2020)			X
(Manuri et al., 2019)			X

(Mascareñas, et al., 2019)	X		
(Masoni, et al., 2017)	X		
(Mensah et al., 2019)	X		
(Metso & Thenent, 2019)		X	
(Morillo et al., 2020)		X	
(Mostia, 2015)		X	
(Mourtzis, Angelopoulos, & Boli, 2018)	X		
(Mourtzis et al., 2020)		X	
(Mourtzis, Zogopoulos, & Vlachou, 2017)	X		
(Mourtzis, Vlachou, & Zogopoulos, 2018)	X		
(Müller, 2019)		X	
(Navas et al., 2020)		X	
(Neges et al., 2017)	X		
(Nee et al., 2012)	X		
(Oyekan et al., 2020)		X	
(Pääkkönen & Pakkala, 2020)	X		
(Palmarini et al., 2018)			X
(Park et al., 2020)		X	
(Patalas-Maliszewska & Kłos, 2019)		X	
(Patti et al., 2017)		X	
(Paulo Lima, et al., 2017)	X		
(Pereira et al., 2020)	X		
(Petrovič et al., 2019)	X		
(Piechnicki et al., 2021)		X	
(Piechnicki et al., 2021)		X	
(Pierdicca, et al., 2016)	X		
(Plopski, et al., 2015)	X		
(Poirier, 2016)	X		
(Poor, 2019)		X	
(Poushneh, 2018)		X	
(Prilla, 2019)		X	
(Quint et al., 2017)	X		
(Rautenbach et al., 2016)	X		
(Reina et al., 2017)	X		

Reference			
(Rohidatun et al., 2017)	X		
(Rohidatun et al., 2016)	X		
(Roy et al., 2016)		X	
(Rui et al., 2019)		X	
(Ruiz-Sarmiento, et al., 2020)	X		
(Safi et al., 2019)			X
(Saidy, Valappil, et al., 2020)		X	
(Saidy, Xia, et al., 2020)		X	
(Sanguini, 2016)	X		
(Scurati, et al., 2018)	X		
(Seeling, 2017)	X		
(Serras et al., 2020)		X	
(Shaaban et al., 2015)	X		
(Shi et al., 2020)		X	
(Siew et al., 2020)		X	
(Siew et al., 2019)			X
(Silvestri et al., 2020)			X
(Sperber, 2016)	X		
(Srivastava et al., 2020)		X	
(Stirling, 2016)		X	
(Strollo et al., 2017)	X		
(Tanaka et al., 2019)			X
(Tarng et al., 2015)	X		
(Templin & Popielarczyk, 2020)	X		
(Tezel & Aziz, 2017)		X	
(Turner et al., 2019)			X
(Ullo et al., 2019)			X
(Uva, et al., 2017)		X	
(Valamede & Akkari, 2020)		X	
(Vaidya et al., 2018)		X	
(Vaquero-Melchor et al., 2020)	X		
(Venables, 2017)		X	
(Vignali, et al., 2018)	X		
(von Lukas et al., 2015)	X		

(Walko, 2020)		X	
(Wang, Ren, et al., 2020)			X
(Wang, Zhang, et al., 2020)				X
(Wang & Piao, 2019)		X	
(Wang, 2016)		X	
(Weichelt et al., 2019)		X	
(Wolf et al., 2016)			X
(Xie et al., 2020)	X		
(Yadav & Jain, 2020)	X		
(Yamamoto et al., 2018)	X		
(Yang et al., 2015)	X		
(Yang et al., 2020)	X		
(Yepez et al., 2019)			X
(Younes et al., 2017)				X
(Zhou et al., 2018)	X		
(Zhu et al., 2015)			X
(Zolotová et al., 2020)	X		
Total	73	58	22

References

Abdul Rani, N., Abdul Aziz, F., Hairuddin, A., Ahmad, S., & Hemdi, A. (2020). Augmented reality: capabilities and challenges in machining industry aligned with industry 4.0. *Advances in Materials and Processing Technologies,* 1-9. https://doi.org/10.1080/2374068X.2020.1793269

Aguero, M., Maharjan, D., del Pilar Rodriguez, M., Mascarenas, D., & Moreu, F. (2020). Design and implementation of a connection between augmented reality and sensors. *Robotics, 9*(1),3. https://doi.org/10.3390/robotics9010003

Akbarinasaji, S., & Homayounvala, E. (2017). A novel context-aware augmented reality framework for maintenance systems. *Journal of Ambient Intelligence and Smart Environments, 9*(3), 315-327. https://doi.org/10.3233/AIS-170435

Aleš, Z., Pavlů, J., Legát, V., Mošna, F., & Jurča, V. (2019). Methodology of overall equipment effectiveness calculation in the context of industry 4.0 environment. *Eksploatacja i Niezawodnosc, 21*(3), 411-418. https://doi.org/10.17531/ein.2019.3.7

Ali, A. M., Mohamed, E. A., Yacout, S., & Shaban, Y. (2020). Cloud computing based unsupervised fault diagnosis system in the context of Industry 4.0. *Gestão & Produção, 27*(3). https://doi.org/10.1590/0104-530X5378-20

Alonso-Rosa, M., Gil-de-Castro, A., Moreno-Munoz, A., Garrido-Zafra, J., Gutierrez-Ballesteros, E., & Cañete-Carmona, E. (2020). An IoT based mobile augmented reality application for energy visualization in buildings environments. *Applied Sciences, 10*(2), 600. https://doi.org/10.3390/app10020600

Amirian, P., Basiri, A., Gales, G., Winstanley, A., & McDonald, J. (2015). The next generation of navigational services using OpenStreetMap data: The integration of augmented reality and graph databases. Lecture Notes in *Geoinformation and Cartography*, 211-228. https://doi.org/10.1007/978-3-319-14280-7_11

Ansari, F., Khobreh, M., Seidenberg, U., & Sihn, W. (2018). A problem-solving ontology for human- centred cyber physical production systems. *CIRP Journal of Manufacturing Science and Technology, 22*, 91-106. https://doi.org/10.1016/j.cirpj.2018.06.002

Antonijević, M., Sučić, S., & Keserica, H. (2018). Augmented reality applications for substation management by utilizing standards-compliant SCADA communication. *Energies, 11*(3), 599. https://doi.org/10.3390/en11030599

Antoniou, P., Dafli, E., Arfaras, G., & Bamidis, P. (2017). Versatile mixed reality medical educational spaces; requirement analysis from expert users. *Personal and Ubiquitous Computing, 21*(6), 1015- 1024. https://doi.org/10.1007/s00779-017-1074-5

Ariansyah, D., Rosa, F., & Colombo, G. (2020). Smart maintenance: A wearable augmented reality application integrated with CMMS to minimise unscheduled downtime. *Computer-Aided Design and Applications, 17*(4), 740-751. https://doi.org/10.14733/cadaps.2020.740-751

Aromaa, S., & Väänänen, K. (2016). Suitability of virtual prototypes to support human factors/ergonomics evaluation during the design. *Applied Ergonomics, 56*, 11-18. https://doi.org/10.1016/j.apergo.2016.02.015

Arshad, H., Chowdhury, S. A., Chun, L. M., Parhizkar, B., & Obeidy, W. K. (2016). A freeze-object interaction technique for handheld augmented reality systems. *Multimedia Tools and Applications, 75*(10), 5819-5839. https://doi.org/10.1007/s11042-015-2543-3

Aschenbrenner, D., Leutert, F., Çençen, A., Verlinden, J., Schilling, K., Latoschik, M., & Lukosch, S. (2019). Comparing human factors for augmented reality supported single-user and collaborative repair operations of industrial robots. *Frontiers in Robotics and AI, 6*, 37. https://doi.org/10.3389/frobt.2019.00037

Aschenbrenner, D., Maltry, N., Kimmel, J., Albert, M., Scharnagl, J., & Schilling, K. (2016). ARTabusing virtual and augmented reality methods for an improved situation awareness for telemaintenance. *IFAC-PapersOnLine, 49*(30), 204-209. https://doi.org/10.1016/j.ifacol.2016.11.168

Aziz, F. A., Abdullah, F., & Win, L. L. (2018). Using marker based augmented reality for training in automotive industry. *International Journal of Recent Technology and Engineering, 7*(4), 118-121.

Aziz, F. A., Alsaeed, A. S., Sulaiman, S., Ariffin, M. K., & Al-Hakim, M. F. (2020). Mixed reality improves education and training in assembly processes. *Journal of Engineering and Technological Sciences, 52*(4), 598-607. https://doi.org/10.5614/j.eng.technol.sci.2020.52.4.10

Baranovski, I., Stankovski, S., Ostojic, G., Horvat, S., & Srdan, T. (2020). Augmented reality support for self-service automated systems. *Journal of Graphic Engineering and Design, 11*(1), 63-68. https://doi.org/10.24867/JGED-2020-1-063

Ben Abdallah, H., Jovančević, I., Orteu, J. -.., & Brèthes, L. (2019). Automatic inspection of aeronautical mechanical assemblies by matching the 3D CAD model and real 2D images. *Journal of Imaging, 5*(10).
https://doi.org/10.3390/jimaging5100081

Bottani, E., & Vignali, G. (2018). Augmented reality technology in the manufacturing industry: a review of the last decade. *IISE Transactions, 51*(3), 1–64.
https://doi.org/10.1080/24725854.2018.1493244

Bousdekis, A., Lepenioti, K., Apostolou, D., & Mentzas, G. (2019). Decision making in predictive maintenance: Literature review and research agenda for industry 4.0. *IFAC-PapersOnLine, 53*(12), 607-612.
https://doi.org/10.1016/j.ifacol.2019.11.226

Bousdekis, A., Wellsandt, S., Bosani, E., Lepenioti, K., Apostolou, D., Hribernik, K., & Mentzas, G. (2021). Human-AI Collaboration in Quality Control with Augmented Manufacturing Analytics. In *IFIP International Conference on Advances in Production Management Systems* (pp. 303-310).
https://doi.org/10.1007/978-3-030-85910-7_32

Bruzzone, A. G., Fancello, G., Daga, M., Leban, B., & Massei, M. (2019). Mixed reality for industrial applications: Interactions in human-machine system and modelling in immersive virtual environment. *International Journal of Simulation and Process Modelling, 14*(2), 165-177.
https://doi.org/10.1504/IJSPM.2019.099910

Buchori, A., Setyosari, P., Wayan Dasna, I., & Ulfa, S. (2017). Mobile augmented reality media design with waterfall model for learning geometry in college. *International Journal of Applied Engineering Research, 12*(13), 3773-3780.

Butt, J. (2020). A conceptual framework to support digital transformation in manufacturing using an integrated business process management approach. *Designs, 4*(3), 1-39.
https://doi.org/10.3390/designs4030017

Cachada, A., Barbosa, J., Leitão, P., Alves, A., Alves, L., Teixeira, J., & Teixeira, C. (2019). Using internet of things technologies for an efficient data collection in maintenance 4.0. In *2019 IEEE International Conference on Industrial Cyber Physical Systems (ICPS)* (pp. 113-118). IEEE.
https://doi.org/10.1109/ICPHYS.2019.8780217

Cachada, A., Barbosa, J., Leitão, P., Geraldes, C., Deusdado, L., Costa, J., . . . Romero, L. (2018). Maintenance 4.0: Intelligent and Predictive Maintenance System Architecture. *IEEE International Conference on Emerging Technologies and Factory Automation, ETFA.2018 p*. 139-146. Torino: IEEE.
https://doi.org/10.1109/etfa.2018.8502489

Cahyati, S., Syaifudin, & Achdianto. (2019). A prototyping of additive manufacturing cell in cyber physical system for maintenance 4.0 preparation. *International Journal of Advanced Science and Technology, 29*(5), 575-584.

Câmara, R. A., Mamede, H. S., & Dos Santos, V. D. (2019). Viable system architecture applied to maintenance 4.0. *Multi Conference on Computer Science and Information Systems, MCCSIS 2019 - Proceedings of the International Conferences on Big Data Analytics, Data Mining and Computational Intelligence 2019 and Theory and Practice in Modern Computing 2019* (p. 127-134). Porto: IADIS Press.
https://doi.org/10.33965/bigdaci2019_201907l016

Ceruti, A., Marzocca, P., Liverani, A., & Bil, C. (2019). Maintenance in Aeronautics in an Industry 4.0 Context: The Role of Augmented Reality and Additive Manufacturing. *Journal of Computational Design and Engineering, 6*(4), 516-526.
https://doi.org/10.1016/j.jcde.2019.02.001

Chaves-Diéguez, D., Pellitero-Rivero, A., García-Coego, D., González-Castaño, F., Rodríguez- Hernández, P., Piñeiro-Gómez, Ó., . . . Costa-Montenegro, E. (2015). Providing iot services in smart cities through dynamic augmented reality markers. *Sensors ,15*(7), 16083-16104.
https://doi.org/10.3390/s150716083

Chen, C.-H., Lee, I.-J., & Lin, L.-Y. (2016). Augmented reality-based video-modeling storybooks of nonverbal facial cues for children with autism spectrum disorder improve their perceptions and judgments of facial expressions and emotions. *Computers in Human Behavior, 55,* 477-485.
https://doi.org/10.1016/j.chb.2015.09.033

Chen, K., & Xue, F. (2020). The renaissance of augmented reality in construction: History, present status and future directions. *Smart and Sustainable Built Environment.*
https://doi.org/10.1108/sasbe-08-2020-0124

Chen, K., Chen, W., Li, C. T., & Cheng, J. C. (2019). A BIM-based location aware A.R. collaborative framework for facility maintenance management. *Journal of Information Technology in Construction, 24,* 360-380.

Chen, K., Yang, J., Cheng, J. C., Chen, W., & Li, C. T. (2020). Transfer learning enhanced A.R. spatial registration for facility maintenance management. *Automation in Construction, 113*. https://doi.org/10.1016/j.autcon.2020.103135

Chen, Y.-J., Lai, Y.-S., & Lin, Y.-H. (2020). BIM-based augmented reality inspection and maintenance of fire safety equipment. *Automation in Construction,* 110. https://doi.org/10.1016/j.autcon.2019.103041

Chicchi Giglioli, I. A., Pallavicini, F. P., Serino, S., & Riva, G. (2015). Augmented reality: A brand new challenge for the assessment and treatment of psychological disorders. *Computational and Mathematical Methods in Medicine*, 2015. https://doi.org/10.1155/2015/862942

Cimino, C., Negri, E., & Fumagalli, L. (2019). Review of digital twin applications in manufacturing.*Computers in Industry*, 113. https://doi.org/10.1016/j.compind.2019.103130

Corradi, A., Foschini, L., Giannelli, C., Lazzarini, R., Stefanelli, C., Tortonesi, M., & Virgilli, G. (2019). Smart appliances and RAMI 4.0: Management and servitisation of ice cream machines. *IEEE Transactions on Industrial Informatics, 15*(2), 1007-1016. https://doi.org/10.1109/TII.2018.2867643

Crivellaro, A., Rad, M., Verdie, Y., Yi, K. M., Fua, P., & Lepetit, V. (2018). Robust 3D object tracking from monocular images using stable parts. *IEEE Transactions on Pattern Analysis and Machine Intelligence, 40*(6), 1465-1479. https://doi.org/10.1109/TPAMI.2017.2708711

Damiani, L., Demartini, M., Guizzi, G., Revetria, R., & Tonelli, F. (2018). Augmented and virtual reality applications in industrial systems: A qualitative review towards the industry 4.0 era. *IFAC-PapersOnLine, 51*(11), 624–630. https://doi.org/10.1016/j.ifacol.2018.08.388

Elia, V., Gnoni, M. G., & Lanzilotto, A. (2016). Evaluating the application of augmented reality devices in manufacturing from a process point of view: An AHP based model. *Expert Systems with Applications, 63*, 187-197. https://doi.org/10.1016/j.eswa.2016.07.006

Fantini, P., Pinzone, M., & Taisch, M. (2020). Placing the operator at the centre of Industry 4.0 design: Modelling and assessing human activities within cyber-physical systems. *Computers & Industrial Engineering, 139,* 105058. https://doi.org/10.1016/j.cie.2018.01.025

Fernández del Amo, I., Erkoyuncu, J., Roy, R., Palmarini, R., & Onoufriou, D. (2018). A systematic review of Augmented Reality content-related techniques for knowledge transfer in maintenance applications. *Computers in Industry, 103*, 47-71. https://doi.org/10.1016/j.rcim.2019.03.014

Fernández del Amo, I., Erkoyuncu, J., Vrabič, R., Frayssinet, R., Vazquez Reynel, C., & Roy, R. (2020). Structured authoring for AR-based communication to enhance efficiency in remote diagnosis for complex equipment. *Advanced Engineering Informatics, 45*. https://doi.org/10.1016/j.aei.2020.101096

Fernández-Caramés, T. M., Fraga-Lamas, P., Suárez-Albela, M., & Vilar-Montesinos, M. (2018). A fog computing and cloudlet based augmented reality system for the industry 4.0 shipyard. *Sensors, 18*(6), 1798. https://doi.org/10.3390/s18061798

Gallab, M., Bouloiz, H., Garbolino, E., Tkiouat, M., ElKilani, M. A., & Bureau, N. (2017). Risk analysis of maintenance activities in a LPG supply chain with a Multi-Agent approach. *Journal of Loss Prevention in the Process Industries, 47*, 41-56. https://doi.org/10.1016/j.jlp.2017.02.026

Gao, D., Xu, Z., Ruan, Y., & Lu, H. (2017). From a systematic literature review to integrated definition for sustainable supply chain innovation (SSCI). *Journal of Cleaner Production, 142*, 1518–1538. https://doi.org/10.1016/j.jclepro.2016.11.153

Gattullo, M., Scurati, G. W., Fiorentino, M., Uva, A. E., Ferrise, F., & Bordegoni, M. (2019). Towards augmented reality manuals for industry 4.0: *A methodology. Robotics and Computer-Integrated Manufacturing, 56*, 276–286. https://doi.org/10.1016/j.rcim.2018.10.001

Gavish, N. G., Webel, S., Rodríguez, J., Peveri, M., Bockholt, U., & Tecchia, F. (2015). Evaluating virtual reality and augmented reality training for industrial maintenance and assembly tasks. *Interactive Learning Environments, 23*(6), 778-798. https://doi.org/10.1080/10494820.2013.815221

Jasiulewicz-Kaczmarek, M., & Gola, A. (2019). Maintenance 4.0 technologies for sustainable manufacturing-an overview. *IFAC-PapersOnLine, 52*(10), 91-96. https://doi.org/10.1016/j.ifacol.2019.10.005

Jasiulewicz-Kaczmarek, M., Legutko, S., & Kluk, P. (2020). Maintenance 4.0 technologies - new opportunities for sustainability driven maintenance. *Management and Production Engineering Review, 11*(2), 74-87. https://doi.org/10.24425/mper.2020.133730

Jetter, J., Eimecke, J., & Rese, A. (2018). Augmented reality tools for industrial applications: What are potential key performance indicators and who benefits?. *Computers in Human Behavior, 87*, 18-33. https://doi.org/10.1016/j.chb.2018.04.054

Kagermann, H., Wahlster, W., Helbig, J., 2013. Recommendations for Implementing the Strategic Initiative INDUSTRIE 4.0. *Final report of the Industrie* 4.0, WG.

Kandemir, C., & Celik, M. (2020). A human reliability assessment of marine auxiliary machinery maintenance operations under ship PMS and maintenance 4.0 concepts. *Cognition, Technology & Work, 22*(3), 473-487. https://doi.org/10.1007/s10111-019-00590-3

Kans, M., Galar, D., & Thaduri, A. (2016). Maintenance 4.0 in Railway Transportation Industry. *In Lecture Notes in Mechanical Engineering* (p. 317-331). Pleiades Publishing. https://doi.org/10.1007/978-3-319- 27064-7_30

Kaur, K., Selway, M., Grossmann, G., Stumptner, M., & Johnston, A. (2018, October). Towards an open-standards based framework for achieving condition-based predictive maintenance. In *Proceedings of the 8th International Conference on the Internet of Things* (pp. 1-8). https://doi.org/10.1145/3277593.3277608

Kawana, H., Usuda, S., Asoda, S., Kaneko, T., Ogawa, K., Itamiya, T., ... & Truppe, M. (2020). Auricular Osseointegrated Implant Treatment: Basic Technique and Application of Computer Technology. *Applied Sciences, 10*(14), 4922. https://doi.org/10.3390/app10144922

Khalek, I. A., Chalhoub, J. M., & Ayer, S. K. (2019). Augmented reality for identifying maintainability concerns during design. *Advances in Civil Engineering, 2019*. https://doi.org/10.1155/2019/8547928

Kharat, S. A., Panage, B. M., & Nagarkar, S. (2017). Use of Q.R. code and layar app for academic library services. *Library Hi Tech News, 34*(3), 21-28. https://doi.org/10.1108/LHTN-12-2016-0060

Khowaja, K., Banire, B., Al-Thani, D., Sqalli, M. T., Aqle, A., Shah, A., & Salim, S. S. (2020). Augmented reality for learning of children and adolescents with autism spectrum disorder (ASD): A systematic review. *IEEE Access, 8*, 78779-78807. https://doi.org/10.1109/ACCESS.2020.2986608

Khowaja, K., Salim, S. S., Asemi, A., Ghulamani, S., & Shah, A. (2020). A systematic review of modalities in computer-based interventions (CBIs) for language comprehension and decoding skills of children with autism spectrum disorder (ASD). *Universal Access in the Information Society, 19*(2), 213-243. https://doi.org/10.1007/s10209-019-00646-1

Kim, T.-Y. (2019). Algorithm design and implementation of the user-optimised A.I. curation system with AR-based characters. *International Journal of Innovative Technology and Exploring Engineering, 8*(8), 61-64.

Kiziroglou, M. E., Boyle, D. E., Yeatman, E. M., & Cilliers, J. J. (2017). Opportunities for sensing systems in mining. *IEEE Transactions on Industrial Informatics, 13*(1), 278-286. https://doi.org/10.1109/TII.2016.2636131

Koo, G., Lee, N., & Kwon, O. (2019). Combining object detection and causality mining for efficient development of augmented reality-based on-the-job training systems in hotel management. *New Review of Hypermedia and Multimedia, 25*(3), 112-136. https://doi.org/10.1080/13614568.2019.1694594

Koteleva, N., Buslaev, G., Valnev, V., & Kunshin, A. (2020). Augmented reality system and maintenance of oil pumps. *International Journal of Engineering, Transactions B: Applications, 33*(8), 1620-1628. https://doi.org/10.5829/ije.2020.33.08b.20

Lamberti, F., Manuri, F., Paravati, G., Piumatti, G., & Sanna, A. (2017). Using semantics to automatically generate speech interfaces for wearable virtual and augmented reality applications. *IEEE Transactions on Human-Machine Systems, 47*(1), 152-164. https://doi.org/10.1109/THMS.2016.2573830

Lawrence, M., & Hendershot, R. J. (2020). Harnessing industry 4.0 to optimise performance in the aluminum industry. *Light Metal Age, 78*(4), 10-14.

Lee, I. J. (2019). Augmented reality coloring book: An interactive strategy for teaching children with autism to focus on specific nonverbal social cues to promote their social skills. *Interaction Studies, 20*(2), 256-274. https://doi.org/10.1075/is.18004.lee

Lee, I. J., Chen, C.-H., Wang, C.-P., & Chung, C.-H. (2018). Augmented reality plus concept map technique to teach children with ASD to use social cues when meeting and greeting. *Asia-Pacific Education Researcher, 27*(3), 227-243. https://doi.org/10.1007/s40299-018-0382-5

Lee, K. W., & Park, J. K. (2019). Comparison of UAV image and UAV lidar for construction of 3D geospatial information. *Sensors and Materials, 31*(10), 3327-3334.
https://doi.org/10.18494/SAM.2019.2466

Leutert, F., & Schilling, K. (2018). Projector-based augmented reality for telemaintenance support. *IFAC-PapersOnLine, 51*(11), 502-507.
https://doi.org/10.1016/j.ifacol.2018.08.368

Lima, J. P., Roberto, R., Simões, F., Almeida, M., Figueiredo, L., Teixeira, J. M., & Teichrieb, V. (2017). Markerless tracking system for augmented reality in the automotive industry. *Expert systems with applications, 82*, 100-114.
https://doi.org/10.1016/j.eswa.2017.03.060

Lima, E., Gorski, E., Loures, E. F., Portela Santos, E. A., & Deschamps, F. (2019). Applying machine learning to AHP multicriteria decision making method to assets prioritisation in the context of industrial maintenance 4.0. *IFAC-PapersOnLine,52*(13),2152-2157.
https://doi.org/10.1016/j.ifacol.2019.11.524

Limbu, B. H., Jarodzka, H., Klemke, R., Wild, F., & Specht, M. (2018). From AR to expertise: A user study of an augmented reality training to support expertise development. J*ournal of Universal Computer Science, 24*(2), 108-128.

Liu, F., & Seipel, S. (2018). Precision study on augmented reality-based visual guidance for facility management tasks. *Automation in Construction, 90*, 79-90.
https://doi.org/10.1016/j.autcon.2018.02.020

Longo, F., Nicoletti, L., & Padovano, A. (2019). Ubiquitous knowledge empowers the smart factory: The impacts of a service-oriented digital twin on enterprises' performance. *Annual Reviews in Control, 47*, 221-236.
https://doi.org/10.1016/j.arcontrol.2019.01.001

López-Fernández, L., García, B., Gallego, M., & Gortázar, F. (2017). Designing and evaluating the usability of an API for real-time multimedia services in the internet. *Multimedia Tools and Applications, 76*(12), 14247-14304.
https://doi.org/10.1007/s11042-016-3729-z

Luchetti, G., Mancini, A., Sturari, M., Frontoni, E., & Zingaretti, P. (2017). Whistland: An augmented reality crowd-mapping system for civil protection and emergency management. *ISPRS International Journal of Geo-Information, 6*(2), 41.
https://doi.org/10.3390/ijgi6020041

Mahmud, R., Ramamohanarao, K., & Buyya, R. (2020). Application management in fog computing environments: A taxonomy, review and future directions. *ACM Computing Surveys (CSUR), 53*(4), 1-43.
https://doi.org/10.1145/3403955

Manuri, F., Pizzigalli, A., & Sanna, A. (2019). A state validation system for augmented reality based maintenance procedures. *Applied Sciences, 9*(10), 2115.
https://doi.org/10.3390/app9102115

Mascareñas, D., Harden, T., Morales, J., Boardman, B., Sosebee, E., Blackhart, C., Wysong, A. (2019). Augmented reality for enabling smart nuclear infrastructure. *Frontiers in Built Environment, 5*, 82.
https://doi.org/10.3389/fbuil.2019.00082

Masoni, R., Ferrise, F., Bordegoni, M., Gattullo, M., Uva, A. E., Fiorentino, M., Di Donato, M. (2017). Supporting Remote Maintenance in Industry 4.0 through Augmented Reality. *Procedia Manufacturing, 11*, 1296-1302.
https://doi.org/10.24425/mper.2020.133730

Mensah, A. K., Etonam, A. K., Mayabi, A. O., Di Gravio, G., & Cheruiyot, C. (2019). A real-time augmented reality system for water distribution system. *International Journal of Recent Technology and Engineering, 8*(3), 3098-3101.
https://doi.org/10.35940/ijrte.C4974.098319

Metso, L., & Thenent, N. E. (2020). Characteristics of Maintenance 4.0 and Their Reflection in Aircraft Engine MRO. *In Advances in Asset Management and Condition Monitoring* (pp. 499-509). Springer, Cham.
https://doi.org/10.1007/978-3-030-57745-2_42

Morillo, P., García-García, I., Orduña, J. M., Fernández, M., & Juan, M. C. (2020). Comparative study of AR versus video tutorials for minor maintenance operations. *Multimedia Tools and Applications. Multimedia Tools and Applications, 79*(11-12), 7073-7100.
https://doi.org/10.1007/s11042-019-08437-9

Mostia, W. (2015). Beyond bhopal. *Control, 28*(8), 32-40.

Mourtzis, D., Vlachou, E., Zogopoulos, V., & Fotini, X. (2017). Integrated production and maintenance scheduling through machine monitoring and augmented reality: An Industry 4.0 approach. In *IFIP International Conference on Advances in Production Management Systems* (pp. 354-362). Springer, Cham.
https://doi.org/10.1007/978-3-319-66923-6_42

Mourtzis, D., Angelopoulos, J., & Boli, N. (2018). Maintenance assistance application of engineering to order manufacturing equipment: A product service system (PSS) approach. *IFAC-PapersOnLine, 51*(11), 217-222.
https://doi.org/10.1016/j.ifacol.2018.08.263

Mourtzis, D., Siatras, V., & Angelopoulos, J. (2020). Real-time remote maintenance support based on augmented reality (AR). *Applied Sciences, 10*(5), 1855. https://doi.org/10.3390/app10051855

Mourtzis, D., Vlachou, E., & Zogopoulos, V. (2018). Mobile apps for providing product-service systems and retrieving feedback throughout their lifecycle: A robotics use case. *International Journal of Product Lifecycle Management, 11*(2), 116-130. https://doi.org/10.1504/IJPLM.2018.092821

Mourtzis, D., Zogopoulos, V., & Vlachou, E. (2017). Augmented reality application to support remote maintenance as a service in the robotics industry. *Procedia Cirp, 63*, 46-51. https://doi.org/10.1016/j.procir.2017.03.154

Müller, T. (2019). Challenges in representing information with augmented reality to support manual procedural tasks. *AIMS Electronics and Electrical Engineering, 3*(1), 71-97. https://doi.org/10.3934/ElectrEng.2019.1.71

Navas, M. A., Sancho, C., & Carpio, J. (2020). Disruptive maintenance engineering 4.0. *International Journal of Quality and Reliability Management, 37*(6-7), 853-871. https://doi.org/10.1108/IJQRM-09-2019-0304

Neges, M., Koch, C., König, M., & Abramovici, M. (2017). Combining visual natural markers and IMU for improved A.R. based indoor navigation. *Advanced Engineering Informatics, 31*, 18-31. https://doi.org/10.1016/j.aei.2015.10.005

Nee, A. Y., Ong, S. K., Chryssolouris, G., & Mourtzis, D. (2012). Augmented reality applications in design and manufacturing. *CIRP annals, 61*(2), 657-679. https://doi.org/10.1016/j.cirp.2012.05.010

Oyekan, J., Farnsworth, M., Hutabarat, W., Miller, D., & Tiwari, A. (2020). Applying a 6 DoF Robotic Arm and Digital Twin to Automate Fan-Blade Reconditioning for Aerospace Maintenance, Repair, and Overhaul. *Sensors, 20*(16), 4637. https://doi.org/10.3390/s20164637

Pääkkönen, P., & Pakkala, D. (2020). Extending reference architecture of big data systems towards machine learning in edge computing environments. *Journal of Big Data, 7*(1), 1-29. https://doi.org/10.1186/s40537-020-00303-y

Palmarini, R., Erkoyuncu, J. A., Roy, R., & Torabmostaedi, H. (2018). A systematic review of augmented reality applications in maintenance. *Robotics and Computer-Integrated Manufacturing, 29*, 215–228. https://doi.org/10.1016/j.rcim.2017.06.002

Park, K.-B., Kim, M., Choi, S. H., & Lee, J. Y. (2020). Deep learning-based smart task assistance in wearable augmented reality. *Robotics and Computer-Integrated Manufacturing, 63*. https://doi.org/10.1016/j.rcim.2019.101887

Patalas-Maliszewska, J., & Kłos, S. (2019). An approach to supporting the selection of maintenance experts in the context of Industry 4.0. *Applied Sciences, 9*(9), 1848. https://doi.org/10.3390/app9091848

Patti, E., Mollame, A., Erba, D., Dalmasso, D., Osello, A., Macii, E., & Acquaviva, A. (2017). Information modeling for virtual and augmented reality. *IT Professional, 19*(3), 52-60. https://doi.org/10.1109/MITP.2017.43

Pereira, M., Burns, D., Orfeo, D., Zhang, Y., Jiao, L., Huston, D., & Xia, T. (2020). 3-D multistatic ground penetrating radar imaging for augmented reality visualisation. *IEEE Transactions on Geoscience and Remote Sensing, 58*(8), 5666-5675. https://doi.org/10.1109/TGRS.2020.2968208

Petrovič, D., Grigillo, D., Kosmatin Fras, M., Urbančič, T., & Kozmus Trajkovski, K. (2021). Geodetic Methods for Documenting and Modelling Cultural Heritage Objects. *International Journal of Architectural Heritage, 15*(6), 885-896. https://doi.org/10.1080/15583058.2019.1683779

Piechnicki, F., Dos Santos, C. F., De Freitas Rocha Loures, E., & Dos Santos, E. A. (2021). Data fusion framework for decision-making support in reliability-centered maintenance. *Journal of Industrial and Production Engineering, 38*(1), 1-17. https://doi.org/10.1080/21681015.2020.1817164

Pierdicca, R., Frontoni, E., Zingaretti, P., Mancini, A., Malinverni, E. S., Tassetti, A. N., . . . Galli, A. (2016). Smart maintenance of riverbanks using a standard data layer and augmented reality. *Computers and Geosciences, 95*, 67-74. https://doi.org/10.1016/j.cageo.2016.06.018

Plopski, A., Itoh, Y., Nitschke, C., Kiyokawa, K., Klinker, G., & Takemura, H. (2015). Corneal- imaging calibration for optical see-through head-mounted displays. *IEEE Transactions on Visualization and Computer Graphics, 21*(4), 481-490. https://doi.org/10.1109/TVCG.2015.2391857

Poirier, L. (2016). Fleet managers see telematics, augmented reality changing maintenance. E*NR (Engineering News-Record), 275*(13).

Poór, P., Basl, J., & Zenisek, D. (2019, March). Predictive Maintenance 4.0 as next evolution step in industrial maintenance development. In *2019 International Research Conference on Smart Computing and Systems Engineering (SCSE)* (pp. 245-253). IEEE. https://doi.org/10.23919/scse.2019.8842659

Poushneh, A. (2018). Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality. *Journal of Retailing and Consumer Services, 41*, 169- 176.
https://doi.org/10.1016/j.jretconser.2017.12.010

Prilla, M. (2019). " I simply watched where she was looking at" Coordination in Short-term Synchronous Cooperative Mixed Reality. *Proceedings of the ACM on Human-Computer Interaction, 3*,1-21.
https://doi.org/10.1145/3361127

Quint, F., Loch, F., & Bertram, P. (2017). The challenge of introducing A.R. in industry - results of a participative process involving maintenance engineers. *Procedia Manufacturing, 11*, 1319-1323.
https://doi.org/10.1016/j.promfg.2017.07.260

Rautenbach, V., Coetzee, S., & Jooste, D. (2016). Results of an evaluation of augmented reality mobile development frameworks for addresses in augmented reality. *Spatial Information Research, 24*(3), 211-223.
https://doi.org/10.1007/s41324-016-0022-1

Reina, A., Cope, A. J., Nikolaidis, E., Marshall, J. A., & Sabo, C. (2017). ARK: Augmented reality for kilobots. *IEEE Robotics and Automation Letters, 2*(3), 1755-1761.
https://doi.org/10.1109/LRA.2017.2700059

Rhoades, E. (2011). Literature reviews. Volta *Review, 111*(3), 353-368.

Rohidatun, M. W., Faieza, A. A., Rosnah, M. Y., & Hayati, S. N. (2017). Develop a virtual and augmented reality system to enhance learning and training assembly. *Journal of Computational and Theoretical Nanoscience, 14*(11), 5617-5620.
https://doi.org/10.1166/jctn.2017.6992

Rohidatun, M. W., Faieza, A. A., Rosnah, M. Y., Nor Hayati, S., & Rahinah, I. (2016). Development of virtual reality (V.R.)system with haptic controller and augmented reality (A.R.) system to enhance learning and training experience. *International Journal of Applied Engineering Research, 11*(16), 8806-8809.

Roy, R., Stark, R., Tracht, K., Takata, S., & Mori, M. (2016). Continuous maintenance and the future–Foundations and technological challenges. *Cirp Annals, 65*(2), 667-688.
https://doi.org/10.1016/j.cirp.2016.06.006

Rui, L., Qin, Y., Li, B., & Gao, Z. (2019). Context-based intelligent scheduling and knowledge push algorithms for ar-assist communication network maintenance. *CMES - Computer Modeling in Engineering and Sciences, 118*(2), 291-315.
https://doi.org/10.31614/cmes.2018.04240

Ruiz-Sarmiento, J.R., Monroy, J., Moreno, F.A., Galindo, C., Bonelo, J. M., & Gonzalez-Jimenez, J. (2020). A predictive model for the maintenance of industrial machinery in the context of industr4.0. *Engineering Applications of Artificial Intelligence, 87*.
https://doi.org/10.1016/j.engappai.2019.103289

Safi, M., Chung, J., & Pradhan, P. (2019). Review of augmented reality in aerospace industry. *Aircraft Engineering and Aerospace Technology, 91*(9), 1187-1194.
https://doi.org/10.1108/AEAT-09-2018-0241

Saidy, C., Valappil, S. P., Matthews, R. M., & Bayoumi, A. (2020). Development of a predictive maintenance 4.0 platform: Enhancing product design and manufacturing. *32nd International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management. 166*, p. 1039- 1049, Springer Science and Business Media
https://doi.org/10.1007/978-3-030-57745-2_86

Saidy, C., Xia, K., Kircaliali, A., Harik, R., & Bayoumi, A. (2020). The application of statistical quality control methods in predictive maintenance 4.0: An unconventional use of statistical process control (SPC) charts in health monitoring and predictive analytics. *32nd International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management, 166*, p. 1051-1061. Springer Science and Business Media.
https://doi.org/10.1007/978-3-030-57745-2_87

Sanguini, R. (2016). Augmented reality in support to helicopter maintenance activities, the TELL ME results. *Mondo Digitale, 15*(64).

Scurati, G. W., Gattullo, M., Fiorentino, M., Ferrise, F., Bordegoni, M., & Uva, A. E. (2018). Converting maintenance actions into standard symbols for Augmented Reality applications in Industry 4.0. *Computers in Industry, 98*, 68-79.
https://doi.org/10.1016/j.compind.2018.02.001

Seeling, P. (2017). Augmented reality device operator cognitive strain determination and prediction.
AIMS Electronics and Electrical Engineering, 1(1), 100-110.
https://doi.org/10.3934/ElectrEng.2017.1.100

Serras, M., García-Sardiña, L., Simões, B., Álvarez, H., & Arambarri, J. (2020). Dialogue enhanced extended reality: *Interactive system for the operator 4.0. Applied Sciences, 10(11).*
https://doi.org/10.3390/app10113960

Shaaban, O. A., Che Mat, R., & Mahayudin, M. H. (2015). The development of mobile augmented reality for laptop maintenance (MAR4LM). *Jurnal Teknologi, 77*(29), 91-96.
https://doi.org/10.11113/jt.v77.6842

Sharma, A., Yadava, G., & Deshmukh, S. (2011). A literature review and future perspectives on maintenance optimisation. *Journal of Quality in Maintenance Engineering, 17*(1), 5-25. https://doi.org/10.1108/13552511111116222

Shi, Y., Du, J., & Zhu, Q. (2020). The impact of engineering information format on task performance: Gaze scanning pattern analysis. *Advanced Engineering Informatics, 46*. https://doi.org/10.1016/j.aei.2020.101167

Siew, C. Y., Chang, M. M., Ong, S. K., & Nee, A. Y. (2020). Human-oriented maintenance and disassembly in sustainable manufacturing. *Computers and Industrial Engineering, 150*. https://doi.org/10.1016/j.cie.2020.106903

Siew, C. Y., Ong, S. K., & Nee, A. Y. (2019). A practical augmented reality-assisted maintenance system framework for adaptive user support. *Robotics and Computer-Integrated Manufacturing, 59*, 115-129. https://doi.org/10.1016/j.rcim.2019.03.010

Silvestri, L., Forcina, A., Introna, V., Santolamazza, A., & Cesarotti, V. (2020). Maintenance transformation through Industry 4.0 technologies: A systematic literature review. *Computers in Industry, 123*. https://doi.org/10.1016/j.compind.2020.103335

Sperber, B. (2016). Plantman go. *Control, 29*(9), 64-72.

Srivastava, P., Shukla, R. K., Sharma, S., Khanduja, D., Gupta, R., Alrasheedi, M., & Singh, G. (2020). Fuzzy methodology approach for prioritising maintenance 4.0 attributes. *Proceedings of International Conference on Computation, Automation and Knowledge Management, ICCAKM 2020*, 308-311. https://doi.org/10.1109/ICCAKM46823.2020.9051483

Stirling, W. (2016). *Through the looking glass. Engineer, 297*(7877), 35-36.

Strollo, R. M., D'Auria, S., & De Silla, F. (2017). A multidisciplinary approach for the digital archaeology. *DISEGNARECON, 10*(19), 9.1-9.12.

Tanaka, F., Tsuchida, M., & Onosato, M. (2019). Associating 2D sketch information with 3D CAD models for VR/AR viewing during bridge maintenance process. *International Journal of Automation Technology, 13*(4), 482-489. https://doi.org/10.20965/ijat.2019.p0482

Tarng, W., Ou, K.-L., Yu, C.-S., Liou, F.-L., & Liou, H.-H. (2015). Development of a virtual butterfly ecological system based on augmented reality and mobile learning technologies. *Virtual Reality, 19*(3-4), 253-266. https://doi.org/10.1007/s10055-015-0265-5

Templin, T., & Popielarczyk, D. (2020). The use of low-cost unmanned aerial vehicles in the process of building models for cultural tourism, 3D web and augmented/mixed reality applications. *Sensors, 20*(19), 5457. https://doi.org/10.3390/s20195457

Tezel, A., & Aziz, Z. (2017). From conventional to it based visual management: A conceptual discussion for lean construction. *Journal of Information Technology in Construction, 22*, 220-246.

Turner, C. J., Emmanouilidis, C., Tomiyama, T., Tiwari, A., & Roy, R. (2019). Intelligent decision support for maintenance: An overview and future trends. *International Journal of Computer Integrated Manufacturing, 32*(10), 936-959. https://doi.org/10.1080/0951192X.2019.1667033

Ullo, S. L., Piedimonte, P., Leccese, F., & De Francesco, E. (2019). A step toward the standardization of maintenance and training services in C4I military systems with Mixed Reality application. *Measurement, 138*, 149-156. https://doi.org/10.1016/j.measurement.2019.02.036

Uva, A. E., Gattullo, M., Manghisi, V. M., Spagnulo, D., Cascella, G. L., & Fiorentino, M. (2017). Evaluating the effectiveness of spatial augmented reality in smart manufacturing: a solution for manual working stations. The International *Journal of Advanced Manufacturing Technology, 94*(1-4), 509– 521. https://doi.org/10.1007/s00170-017-0846-4

Vaidya, S., Ambad, P., & Bhosle, S. (2018). Industry 4.0–a glimpse. *Procedia manufacturing, 20*, 233-238. https://doi.org/10.1016/j.promfg.2018.02.034

Valamede, L. S., & Akkari, A. C. (2020). Lean 4.0: A new holistic approach for the integration of lean manufacturing tools and digital technologies. *International Journal of Mathematical, Engineering and Management Sciences, 5*(5), 854-868. https://doi.org/10.33889/IJMEMS.2020.5.5.066

Vaquero-Melchor, D., Bernardos, A. M., & Bergesio, L. (2020). SARA: A Microservice-Based Architecture for Cross-Platform Collaborative Augmented Reality. *Applied Sciences, 10*(6), 2074. https://doi.org/10.3390/app10062074

Venables, M. (2017). Future maintenance: Transitioning from digitalisation to industry 4.0. *Plant Engineer, 2017*, 10-12.

Vignali, G., Bertolini, M., Bottani, E., Di Donato, L., Ferraro, A., & Longo, F. (2018). Design and testing of an augmented reality solution to enhance operator safety in the food industry. *International Journal of Food Engineering, 14*(2). https://doi.org/10.1515/ijfe-2017-0122

von Lukas, U. F., Quarles, J., Kaklis, P., & Dolereit, T. (2015). Underwater mixed environments.Lecture Notes *in Computer Science, 8844*, 56-76.
https://doi.org/10.1007/978-3-319-17043-5_4

Walko, C., & Schuchardt, B. (2021). Increasing helicopter flight safety in maritime operations with a head-mounted display. *CEAS Aeronautical Journal, 12*(1), 29-41.
https://doi.org/10.1007/s13272-020-00474-7

Wang, N., Ren, S., Liu, Y., Yang, M., Wang, J., & Huisingh, D. (2020). An active preventive maintenance approach of complex equipment based on a novel product-service system operation mode. *Journal of Cleaner Production, 277*.
https://doi.org/10.1016/j.jclepro.2020.123365

Wang, P., Zhang, S., Billinghurst, M., Bai, X., He, W., Wang, S., . . . Zhang, X. (2020). A comprehensive survey of A.R./MR-based co-design in manufacturing. *Engineering with Computers, 36*(4), 1715-1738.
https://doi.org/10.1007/s00366-019-00792-3

Wang, T.-K., & Piao, Y. (2019). Development of BIM-AR-based facility risk assessment and maintenance system. *Journal of Performance of Constructed Facilities, 33*(6).
https://doi.org/10.1061/(ASCE)CF.1943-5509.0001339

Wang, Y. A. (2016). Applying the technology acceptance model to understand aviation students' perceptions toward augmented reality maintenance training instruction. *International Journal of Aviation, Aeronautics, and Aerospace, 3*(4), 3.
https://doi.org/10.15394/ijaaa.2016.1144

Weichelt, B., Heimonen, T., Pilz, M., Yoder, A., & Bendixsen, C. (2019). An argument against cross- platform development: Lessons from an augmented reality app prototype for rural emergency responders. *JMIR mHealth and uHealth, 7*(3).
https://doi.org/10.2196/12207

Wolf, M. J., Grodzinsky, F. S., & Miller, K. W. (2016). There's something in your eye: Ethical implications of augmented visual field devices. *Journal of Information, Communication and Ethics in Society, 14*(3), 214-230.
https://doi.org/10.1108/JICES-10-2015-0035

Xie, X., Lu, Q., Rodenas-Herraiz, D., Parlikad, A. K., & Schooling, J. M. (2020). Visualised inspection system for monitoring environmental anomalies during daily operation and maintenance. *Engineering, Construction and Architectural Management, 27*(8), 1835-1852.
https://doi.org/10.1108/ECAM-11-2019-0640

Yadav, S. K., & Jain, N. (2020). Development of intelligent driving model using augmented reality. *International Journal of Scientific and Technology Research, 9*(3), 1332-1335.

Yamamoto, T., Otsuki, M., Kuzuoka, H., & Suzuki, Y. (2018). Tele-guidance system to support anticipation during communication. *Multimodal Technologies and Interaction, 2*(3).
https://doi.org/10.3390/mti2030055

Yang, S.-R., Chang, J.-R., Lin, H.-M., & Lin, K.-H. (2015). Identification of manholes beneath pavements using RFID and A.R. technologies. *Journal of Testing and Evaluation, 43*(2), 472-478.
https://doi.org/10.1520/JTE20140136

Yang, X., Fan, X., Wang, J., Yin, X., & Qiu, S. (2020). Edge-based cover recognition and tracking method for an AR-aided aircraft inspection system. *International Journal of Advanced Manufacturing Technology, 111*(11-12), 3505-3518.
https://doi.org/10.1007/s00170-020-06301-x

Yepez, P., Alsayyed, B., & Ahmad, R. (2019). Intelligent assisted maintenance plan generation for corrective maintenance. *Manufacturing Letters, 21*, 7-11.
https://doi.org/10.1016/j.mfglet.2019.06.004

Younes, G., Asmar, D., Shammas, E., & Zelek, J. (2017). Keyframe-based monocular SLAM: Design, survey, and future directions. *Robotics and Autonomous Systems, 98*, 67-88.
https://doi.org/10.1016/j.robot.2017.09.010

Zhou, Z., Tan, L., Gu, B., Zhang, Y., & Wu, J. (2018). Bandwidth slicing in software-defined 5g: A stackelberg game approach. *IEEE Vehicular Technology Magazine, 13*(2), 102-109.
https://doi.org/10.1109/MVT.2018.2814022

Zhu, J., Ong, S. K., & Nee, A. Y. (2015). A context-aware augmented reality assisted maintenance system. International *Journal of Computer Integrated Manufacturing, 28*(2), 213-225.
https://doi.org/10.1080/0951192X.2013.874589

Zolotová, I., Papcun, P., Kajáti, E., Miškuf, M., & Mocnej, J. (2020). Smart and cognitive solutions for Operator 4.0: Laboratory H-CPPS case studies. *Computers & Industrial Engineering*, *139*, 105471.
https://doi.org/10.1016/j.cie.2018.10.032